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(72) LANOUE, Michel, CA
(72) LAVOIE, Jean-François, CA
(71) IPL INC , CA

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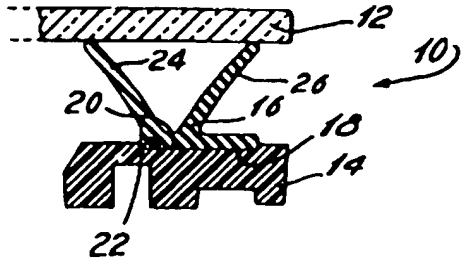
(54) **METHODE DE FORMAGE D'UN CADRE DE FENETRE**
(54) **METHOD OF FORMING A WINDOW FRAME**



(57) Methode de formage d'un cadre de fenêtre comprenant une partie thermoplastique rigide et une partie elastomérique définissant un rebord d'étanchéité La methode comprend les étapes suivantes former la partie thermoplastique rigide dans un moule à noyau/cavité; ouvrir le moule tout en maintenant la partie thermoplastique dans le noyau; aligner le noyau avec une deuxième cavité dont la configuration et la dimension permettent de former le rebord d'étanchéité, et mouler ce dernier directement sur la partie thermoplastique rigide.

(57) A method of forming a window frame including a rigid thermoplastic portion and an elastomeric portion defining a lip seal is described herein. The method generally consists in forming the rigid thermoplastic portion in a core/cavity mold assembly, opening the mold assembly while maintaining the rigid thermoplastic portion in the core, placing the core in line with a second cavity configured and sized to form the lip seal and molding the lip seal directly onto the rigid thermoplastic portion

Abstract of the disclosure

A method of forming a window frame including a rigid thermoplastic portion and an elastomeric portion defining a lip seal is described herein. The method generally consists in forming the rigid thermoplastic portion in a core/cavity mold assembly, opening the mold assembly while maintaining the rigid thermoplastic portion in the core, placing the core in line with a second cavity configured and sized to form the lip seal and molding the lip seal directly onto the rigid thermoplastic portion.

TITLE OF THE INVENTION

Method of forming a window frame.

FIELD OF THE INVENTION

The present invention pertains to a method of forming a window frame made of synthetic plastic material by molding at least one resilient lip seal of elastomeric material to a frame of rigid thermoplastic material to form an integral assembly, all operations being done by a single injection molding machine.

BACKGROUND OF THE INVENTION

Forming window frames using more than one type of plastic material is well known in the art. These window frames are usually provided with a rigid frame portion made of a rigid thermoplastic material and a deformable seal portion made of elastomeric material.

One method for making such window frames is to separately mold the rigid frame portion and the deformable seal portion and subsequently assemble these two portions mechanically. This method has the significant drawback of requiring post-molding assembly operations that usually increase the production cost of the window frames. Furthermore, since the deformable seal portion is usually made from an extrusion process, the profile of this portion is constant around the periphery of the frame which may be a drawback.

Another method for making window frames made of more than one type of plastic material consist of a three-step process. Firstly, the frame portion is molded in a first mold assembly. The frame portion is then ejected from the first mold assembly and mounted to a second mold assembly.

Finally, the deformable seal portion is molded, in the second mold assembly, directly onto the surface of the frame portion. United States Patent N° 5,503,452 issued on April 2, 1996 to Moretz et al. describes such a method to make a vehicle tilt-out window with seal insert. A major drawback of this technique is that two molds and two injection molding machines are required to form the window frame, resulting in handling and part dimensions problems which affect both the quality and the cost of the product.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide an improved method of forming a window frame.

It is another object of the present invention to provide a method of molding a window frame in a single injection molding machine having multiple identical cores and multiple non-identical cavities.

SUMMARY OF THE INVENTION

More specifically, in accordance with the present invention, there is provided a method of forming, in a single injection molding machine having core portion including first and second identical cores and a cavity portion including first and second non-identical cavities, a frame of rigid thermoplastic having an integral resilient lip seal, the frame being configured and sized to support a glass panel movable relative to the frame between opened and closed positions and sealed to the frame by the lip seal when in the closed position, the method comprising the steps of:

molding a frame of rigid thermoplastic material in the first core and in the first cavity defining a frame configuration;

opening the mold while maintaining the molded frame in the first core;

moving the core portion so as to bring the first core in line with the second cavity defining a lip seal configuration whereby, simultaneously, the second core without a frame comes in line with the first cavity;

closing the mold;

molding a lip seal by injecting an elastomeric material over the previously molded frame in the first core and in the second cavity defining a frame configuration, while simultaneously molding, in the second core and the first cavity, a second frame of rigid thermoplastic material;

opening the mold and ejecting the first formed window frame with lip seal.

According to another aspect of the present invention, there is provided a method of forming, in a single injection molding machine having core portion including first, second and third identical cores and a cavity portion including first, second and third non-identical cavities, a frame of rigid thermoplastic having an integral resilient lip seal, the frame being configured and sized to support a glass panel movable relative to the frame between opened and closed positions and sealed to the frame by the lip seal when in the closed position, the method comprising the steps of:

molding a first frame of rigid thermoplastic material in the first core and in the first cavity defining a frame configuration;

opening the mold while maintaining the molded frame in the first core;

moving the core portion so as to bring the first core in line with the second cavity defining a lip seal configuration whereby, simultaneously, the second core without a frame comes in line with the first cavity;

closing the mold;

molding a lip seal by injecting an elastomeric material over first frame in the first core and in the second cavity defining a frame configuration, while simultaneously molding, in the second core and the first cavity, a second frame of rigid thermoplastic material;

opening the mold while maintaining the first frame in the first core and the second frame in the second core;

moving the core portion so as to bring the first core in line with the third cavity whereby, simultaneously, (a) the third core without a frame comes in line with the first cavity, and (b) the second core with the second frame comes in line with the second cavity;

closing the mold;

molding an additional feature by injecting plastic material over the first frame in the first core and in the third cavity, while simultaneously molding, (a) a lip seal by injecting an elastomeric material over second frame in the second core and in the second cavity defining a frame configuration, and (b) a third frame of rigid thermoplastic material in the third core and the first cavity;

opening the mold and ejecting the first formed window frame with lip seal.

Other objects, advantages and features of the present invention will become more apparent upon reading of the following non restrictive description of preferred embodiments thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the appended drawings:

Figure 1 is an elevational view of a vehicle tilt-out glass panel used in connection with the present invention;

Figure 2 is an elevational view of the window frame made in accordance with the present invention;

Figure 3 is a cross-sectional view taken along lines 3-3 of figure 2 with the addition of a glass panel;

Figure 4 is a schematic front view showing a first mold arrangement in an injection machine configured to carry out the present invention;

Figure 5 is a schematic top view showing a second mold arrangement in an injection machine configured to carry out the present invention; and

Figure 6 is a schematic front elevational view showing a third mold arrangement in an injection machine configured to carry out the present invention.

DESCRIPTION OF THE INVENTION

Referring now to figures 1, 2 and 3 of the appended drawings, a tilt-out window frame 10 made according to the method of the present invention will be described. This type of tilt-out window frame is well known in the art and is usually mounted as a side vent window in a truck cab or van body.

The window frame 10 serves to mount, within the vehicle window opening, a window glass panel 12 in a pivotal manner for movement between open and closed positions. The glass panel 12 is usually attached to the window frame by a hinge system (not shown).

Referring more particularly to figure 3, the frame 10 is formed of two parts consisting of a rigid thermoplastic material part 14 and an elastomeric flexible material part 16 defining a lip seal. An undersurface 18 of part 16 is chemically bounded at 20 to the top surface 22 of the rigid plastic material part 14. The top surface of part 16 displays a pair of lips 24 and 26 which are configured and sized to sealingly contact the glass panel 12 when the glass panel is in the closed position.

The bound 20 between parts 14 and 16 may also alternatively be mechanical. If this is the case, the undersurface 18 and/or the top surface 22 would advantageously be provided with interlocking features (not shown) such as, for example, tapered slots or holes in order to provide an adequate mechanical bound.

Referring now more specifically to figure 4 of the appended drawings, a schematic view of a first injection machine 28 to carry out the method of the present invention will be described. The injection machine 28 includes a mold having a core portion 30 and a cavity portion 32. The core portion 30 has two identical cores 34 and 36 while the cavity portion 32 has two non-identical cavities 38 and 40.

The two identical cores 34 and 36 of the core portion 30 are configured and sized to form the undersurface of part 14 of the frame. Conversely, in the case of the cavity portion 32, cavity 38 is configured and sized to form the top surface 22 of the frame whereas cavity 40 is configured

and sized to form the top surface of the part 16 displaying the lips 24 and 26. Hence, the mold cores are identical but the mold cavities differ.

The core portion 30 and cavity portion 32 are not fixedly positioned with respect to one another. Arrow 42 illustrates the movement of these portions 30 and 32 to close or to open the mold assembly. Furthermore, as illustrated by arrow 44, the core portion 30 may rotate about a rotational axis 46.

It is to be noted that the representation of the injection mold 28 is schematic and that many elements have been omitted since they are not within the scope of the present invention.

The molding process of this embodiment of the present invention is as follows. First, a part 14 of rigid thermoplastic material is molded in the core 34 and cavity 38 assembly of the injection mold 28. The mold is then opened (see arrow 42) and the molded part 14 made of rigid thermoplastic material remains in the core 34 of the mold. The core portion 30 is then rotated about the rotation axis 46 as indicated by arrow 44 to align the core 34 with the cavity 40 in which there is a lip seal configuration. Simultaneously, core 36, without a part, comes in line with cavity 38. Subsequently, the mold is closed (see arrow 42) and a flexible part 16 is formed by injecting an elastomeric material over the rigid part 14 molded previously. Again, at the same time, in the other cavity, another rigid part 14 is molded.

The mold is then opened, the complete frame 10 is ejected from the core 34 of the core portion 30. The core portion 30 is then rotated to that the core 34 and the cavity 38 are once more aligned and the process is repeated.

It is to be noted that the movements of the core portion 30 could be different from the rotational movements described hereinabove, as long as these movements allow one core to be alternatively positioned in front of two different cavities.

As mentioned above, the bound between the rigid plastic material and the flexible elastomeric material may be done by heat from the injection of the second material if both materials are chemically compatible, like polypropylene or a thermoplastic elastomer such as, for example, santoprene. In the case where the materials are not chemically compatible, the bound can be mechanical as described above.

Referring now to figure 5 of the appended drawings, a schematic view of a second injection machine 48 to carry out the method of the present invention will be described. It is to be noted that the general mode of operation of the injection machine 48 is very similar to the mode of operation of the injection machine 28 of Figure 4.

The injection machine 48 includes a three-section mold. This mold includes a core portion 50 provided with opposite identical core 52 and 54, a first cavity portion 56 configured as a rigid part 14 cavity and a second cavity portion 58 configured as a flexible part 16 cavity. The first and second cavity portions are so mounted to the injection machine as to face one of the cores 52, 54 of the core portion 50.

The core portion 50 may be rotated (see arrow 60) about a rotation axis 62 while the first and second cavity portions 56, 58 may be moved (see respective arrows 64, 66) to close or to open the mold.

The operation of the injection machine 48 is similar to the operation of the injection machine 28 of Figure 4. Indeed, the core portion 50 is rotated 180° as indicated by arrow 60 after a first molding step where the rigid part 14 has been molded.

As will be easily understood by one skilled in the art, the frame 10 has been described hereinabove as an example of a frame that may be formed using the method of the present invention. It is therefore to be understood that the method of the present invention is not limited in scope to the production of such vehicle window frames.

Figure 6 of the appended drawings, illustrates that the number of types of plastic material forming a particular article to be molded according to the method of the present invention is not limited to two. As a non-limiting example, the lip 24 and the lip 26 could be formed of different plastic material.

A two-portion mold 70 includes a cavity portion 72 provided with three non-identical cavities 74, 76 and 78, and a core portion 80 provided with three identical cores 82, 84, and 86.

Again, the core portion 80 may rotate (see arrow 88) about a rotational axis 90 so as to align the cores 82, 84 and 86 with different cavities 74, 76 and 78 for different molding operations.

As will be easily understood by one skilled in the art, the method of the present invention allows the designer to vary the profile of the part 16 (Figure 3) defining the lips 24 and 26 according to the position onto the frame.

Although the invention has been described above in relation to two specific forms, it will be evident to a person skilled in the art that it may be modified and refined in various ways. It is therefore wished to have it understood that the present invention should not be limited in scope, except by the terms of the following claims.

CLAIMS

1. A method of forming, in a single injection molding machine having core portion including first and second identical cores and a cavity portion including first and second non-identical cavities, a frame of rigid thermoplastic having an integral resilient lip seal, the frame being configured and sized to support a glass panel movable relative to the frame between opened and closed positions and sealed to the frame by the lip seal when in the closed position, the method comprising the steps of:

molding a frame of rigid thermoplastic material in the first core and in the first cavity defining a frame configuration;

opening the mold while maintaining the molded frame in the first core;

moving the core portion so as to bring the first core in line with the second cavity defining a lip seal configuration whereby, simultaneously, the second core without a frame comes in line with the first cavity;

closing the mold;

molding a lip seal by injecting an elastomeric material over the previously molded frame in the first core and in the second cavity defining a frame configuration, while simultaneously molding, in the second core and the first cavity, a second frame of rigid thermoplastic material;

opening the mold and ejecting the first formed window frame with lip seal.

2. A method as defined in claim 1, wherein the bound between the rigid thermoplastic material and the elastomeric material is done by heat during injection of the elastomeric material.

3. A method as defined in claim 1, wherein the bound between the rigid thermoplastic material and the elastomeric material is mechanical with reversed tapered slots or holes in the mold parts.

4. A method as defined in claim 1, wherein the seal is molded first and the frame thereafter.

5. A method of forming, in a single injection molding machine having core portion including first, second and third identical cores and a cavity portion including first, second and third non-identical cavities, a frame of rigid thermoplastic having an integral resilient lip seal, the frame being configured and sized to support a glass panel movable relative to the frame between opened and closed positions and sealed to the frame by the lip seal when in the closed position, the method comprising the steps of:

molding a first frame of rigid thermoplastic material in the first core and in the first cavity defining a frame configuration;

opening the mold while maintaining the molded frame in the first core;

moving the core portion so as to bring the first core in line with the second cavity defining a lip seal configuration whereby, simultaneously, the second core without a frame comes in line with the first cavity;

closing the mold;

molding a lip seal by injecting an elastomeric material over first frame in the first core and in the second cavity defining a frame configuration, while simultaneously molding, in the second core and the first cavity, a second frame of rigid thermoplastic material;

opening the mold while maintaining the first frame in the first core and the second frame in the second core;

moving the core portion so as to bring the first core in line with the third cavity whereby, simultaneously, (a) the third core without a frame comes in line with the first cavity, and (b) the second core with the second frame comes in line with the second cavity;

closing the mold;

molding an additional frame feature by injecting plastic material over the first frame in the first core and in the third cavity, while simultaneously molding, (a) a lip seal by injecting an elastomeric material over the second frame in the second core and in the second cavity defining a frame configuration, and (b) a third frame of rigid thermoplastic material in the third core and the first cavity,

opening the mold and ejecting the first formed window frame with lip seal.

6. A method as defined in claim 5, wherein the bound between the rigid thermoplastic material and the elastomeric material is done by heat during injection of the elastomeric material.

7 A method as defined in claim 5, wherein the bound between the rigid thermoplastic material and the elastomeric material is mechanical with reversed tapered slots or holes in the mold parts.

8. A method as defined in claim 5, wherein the sequence of the three molding steps may vary.

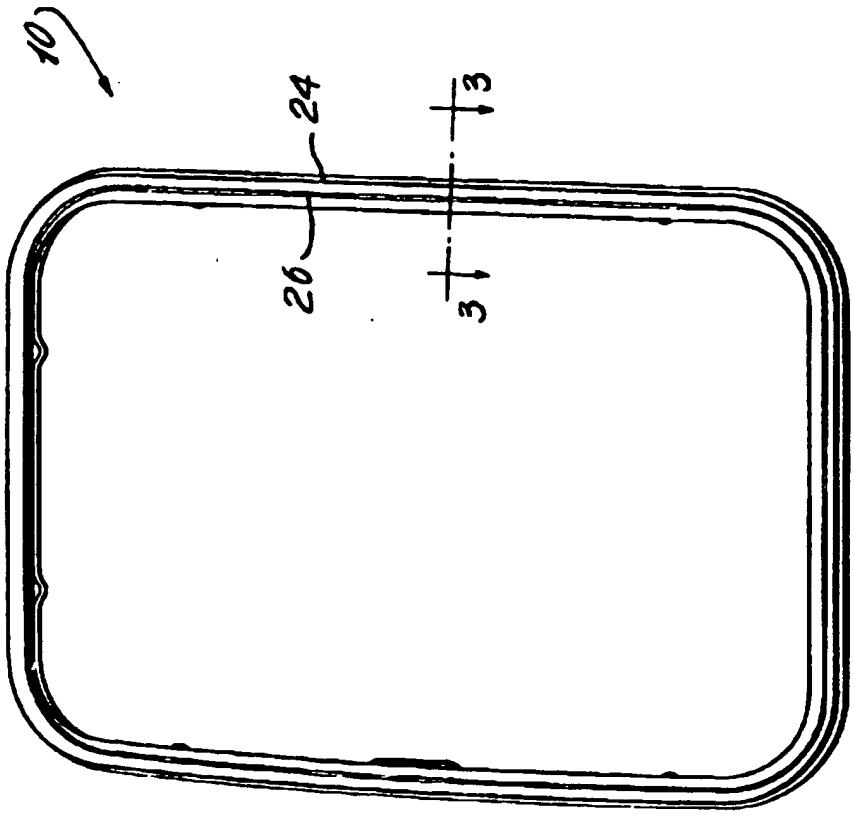


Fig. 2

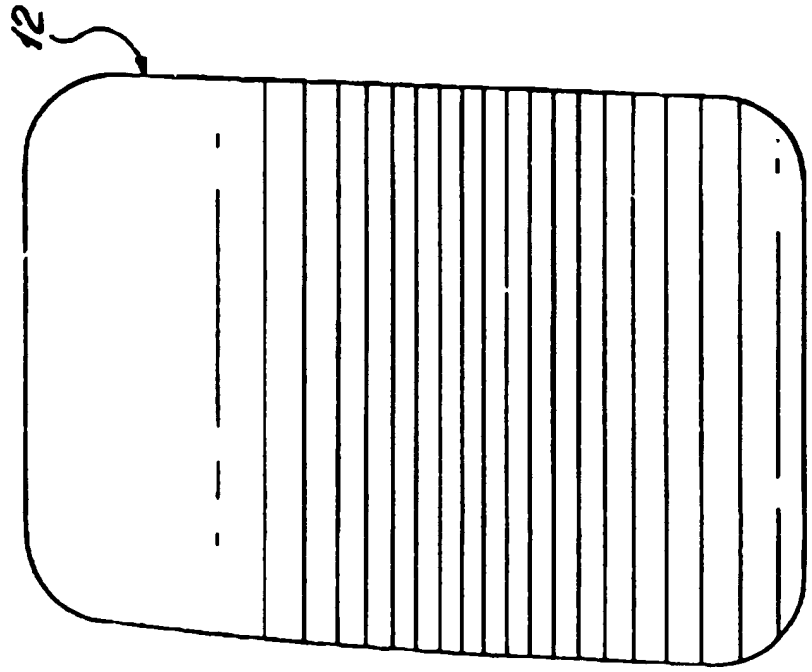


Fig. 1

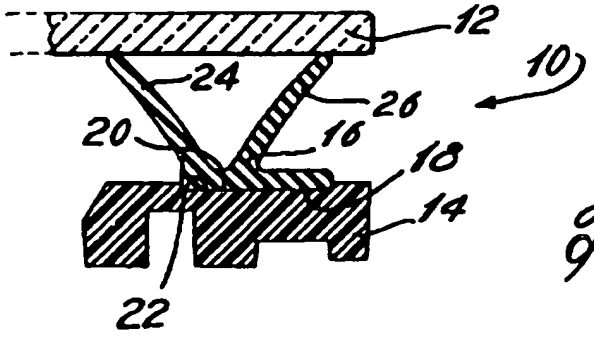


Fig. 3

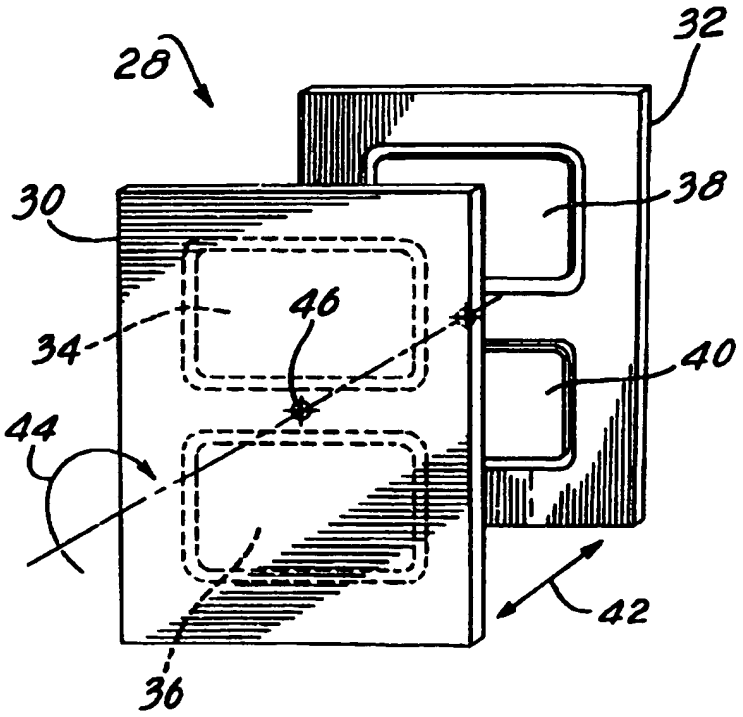


Fig. 4

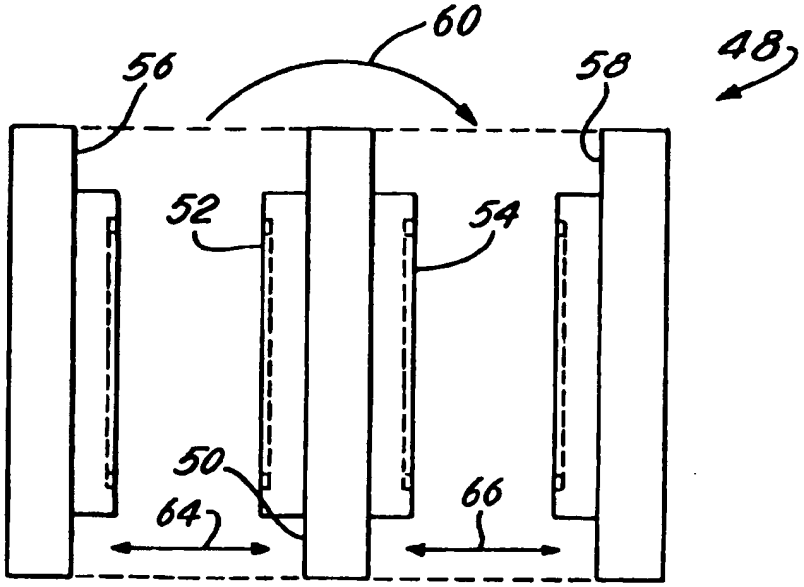


Fig. 5

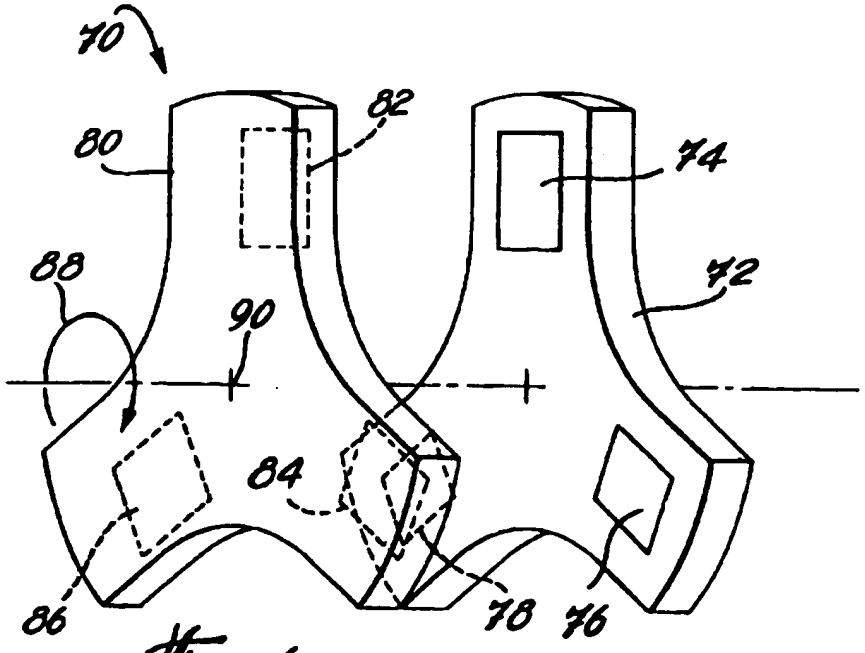


Fig. 6